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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

PARK, ILWOO

ART UNIT

PAPER NUMBER

2182

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/815,272	Applicant(s) BROWN ET AL.	
	Examiner ILWOO PARK	Art Unit 2182	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1, 8, 17, and 24 are amended in response to the last office action. Yu, Skazinski et al., and Beardsley et al were cited, previously. Claims 1-31 are presented for examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 7-10, 14, 15, 17, 18, 23-26, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al. [US 2006/0085612] in view of Tremblay et al. [US 6,728,898 B2].

As for claims 1, 8, and 24, Nakano et al teach an apparatus comprising:

an integrated circuit (IC) to receive [e.g., "host issues a data update (write) instruction to a storage sub-system 1" in paragraph 0064; fig. 2] an input/output (I/O) request to write data stored on at least one target device comprised in at least one local storage array [e.g., "disk drive 2" of the storage sub-system 1 in figs. 2, 6] and generate one or more I/O transactions [e.g., "data #1- data #4" in fig. 6] to write data on at least one target device comprised in at least one remote storage array [e.g., "disk drive 2" of the storage sub-system 2 in figs. 2, 6], said IC further storing ["transfer state/bit map are stored in the control memory 6" in paragraph 0098] in the IC a counter including a plurality of bits ["transfer state/bit map" having each 'update flag' corresponding to each

Art Unit: 2182

'block number' in fig. 4] corresponding to a plurality of data blocks transmitted during said one or more I/O transactions if said plurality of data blocks were not successfully written to said at least one remote storage array ['Update flag On (1) means that the pertinent data is the transmission target' in paragraph 0108], the counter further to clear said plurality of bits if said data blocks are successfully written to said at least one remote storage array ['Update flag set to 0 means that once a normal Update is performed' in paragraph 0108], said IC also to generate and store, if the at least one remote storage array is inoperative during said one or more I/O transactions, a bitmap image ["When the storage sub-system 1 detects the occurrence of a blockage in the storage sub-system 2 (S131), first, the storage sub-system 1 generates a bit map in correlation with the data storage location for a predetermined block unit in the logical volume (first storage resource) of the system 1" in paragraph 0193] representing data that is to be written to said at least one remote storage array.

However, Nakano et al do not explicitly teach that the generated bitmap image is stored in said at least one local storage array. Tremblay et al teach an IC [e.g., "master I/O controller 115" in fig. 1] to generate, if at least one remote storage array ["slave data storage 110" in fig. 1] is inoperative during said one or more I/O transactions ["synchronization was unsuccessful (step 455)" in fig. 4; col. 9, lines 38-44], a bitmap image ["master I/O controller combines the backup copy of the disk change bit map (typically by OR-ing)(step 470) in col. 9, lines 44-51] and to store in at least one local storage array ["bit map in this implementation is stored on the disk" in col. 4, lines 53-59; "master data storage 105" in fig. 1]. Therefore, it would have been obvious to one of

Art Unit: 2182

ordinary skill in the art at the time the invention was made to include the Tremblay et al's teaching of storing the bitmap image in one of local storage array in order to increase convenience when the apparatus is shut down [Tremblay et al: col. 4, lines 53-59] or reliability to allow for recovery if a failure occurs during the synchronization process [Tremblay et al: col. 5, lines 25-27].

4. As for claims 2, 18, and 25, Nakano et al teach said integrated circuit is further capable of generating one or more I/O transactions capable of writing data on at least one target device comprised in at least one local storage array ["write data to a storage sub-system 1" in fig. 5].

5. As for claims 7 and 23, the combination of Nakano et al and Tremblay et al teaches said integrated circuit capable of receiving an input/output (I/O) request to read data stored on at least one target device comprised in at least one local storage array, said integrated circuit further capable of generating one or more I/O transactions capable of reading data on at least one target device comprised in at least one remote storage [e.g., paragraph 0086 in Nakano et al; col. 3, lines 54-62 in Tremblay et al].

6. As for claim 9, the combination of Nakano et al and Tremblay et al teaches generating at least one of said I/O transactions to mirror data on said local storage array and said remote storage array [col. 10, lines 33-37].

7. As for claims 10 and 26, the combination of Nakano et al and Tremblay et al teaches generating one or more I/O transactions to stripe data on said local storage array and said remote storage array [Tremblay et al: col. 4, lines 34-41].

Art Unit: 2182

8. As for claims 14 and 30, Nakano et al teach determining the status of said remote storage array, and, if said remote storage array is incapable of receiving data, regenerating said one or more I/O transactions to write data to said remote storage array at one or more preselected times [paragraph 0109].

9. As for claims 15 and 31, Tremblay et al teaches storing information based on data unwritten data related to said I/O transactions to write data to said remote storage array, and, retrieving said information based on data unwritten data to said remote storage array [col. 4, lines 53-59].

10. As for claim 17, Nakano et al further teach a circuit card comprising an integrated circuit (IC) configured to communicate in accordance with a plurality of different communication protocols [paragraph 0076], the circuit card (IC) configured to be coupled to a bus [fig. 2]. 19].

11. Claims 3, 4, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al. [US 2006/0085612] in view of Tremblay et al. [US 6,728,898 B2] as applied to claims 1 and 17 above, and further in view of Kodama [US 2003/0229819 A1].

As for claims 3 and 20, though the combination of Nakano et al [paragraph 0094] and Tremblay et al [col. 4, lines 33-40] teaches said local storage array and said remote storage array each comprises a redundant array of inexpensive disks (RAID), the combination does not expressly disclose the RAID comprises RAID Level 1 storage arrays. Kodama teaches an apparatus for writing data on at least one target device comprised in at least one local storage array [e.g., “internal disk drive 010109” in fig. 1]

Art Unit: 2182

and at least one target device comprised in at least one remote storage array ["remote disk drive 0105" in fig. 1] using a bitmap [fig. 5] in RAID Level 1 storage arrays [paragraph 0008]. At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify to include RAID Level 1 storage arrays in order to increase applicability of the RAID of combination.

As for claims 4 and 20, the combination of Nakano et al, Tremblay et al, and Kodama teaches a transaction to mirror data on at least one of said RAID Level 1 storage array in response to said I/O request to write data stored on at least one target device comprised in at least one local storage array [Kodama: paragraph 0008].

12. Claims 5, 6, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al. [US 2006/0085612] in view of Tremblay et al. [US 6,728,898 B2] as applied to claims 1 and 17 above, and further in view of Skazinski et al [US 6,574,709 B1].

As for claims 5 and 21, though the combination of Nakano et al [paragraph 0094] and Tremblay et al [col. 4, lines 33-40] teaches said local storage array and said remote storage array each comprises a redundant array of inexpensive disks (RAID), the combination does not expressly disclose the RAID comprises at least one of RAID Level 0, RAID Level 10, and RAID Level 1E storage arrays. However, Skazinski et al teach said local storage array and said remote storage array each comprises a redundant array of inexpensive disks (RAID) each comprising at least one of RAID Level 0, RAID Level 10, and RAID Level 1E storage arrays ["RAID level 0 type" in col. 9, lines 5-8]]. At the time of the invention, it would have been obvious to one of ordinary skill in the art to

Art Unit: 2182

modify to include RAID Level 1 storage arrays in order to increase applicability of the RAID of combination.

As for claims 6 and 22, the combination of Nakano et al, Tremblay et al, and Skazinski et al teaches said local storage array and said remote storage array each comprises a transaction to stripe data on at least one of said of RAID Level 0, RAID Level 10, and RAID Level 1E storage arrays in response to said I/O request to write data stored on at least one target device comprised in at least one local storage array [Skazinski et al: "RAID level 0 type" in col. 9, lines 5-8]

13. Claims 11-13, 16, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al. [US 2006/0085612] in view of Tremblay et al. [US 6,728,898 B2] as applied to claim 8 above, and further in view of Yu [US 5,764,903].

As for claims 11 and 27, though the combination of Nakano et al and Tremblay et al do not expressly disclose receiving an input/output (I/O) request to read data stored on at least one target device comprised in at least one local storage array; and generating one or more I/O transactions capable of reading data on at least one target device comprised in at least one remote storage array. Yu teaches receiving [col. 11, lines 47-52] an input/output (I/O) request to read data stored on at least one target device comprised in at least one local storage array; and generating [col. 10, lines 33-37] one or more I/O transactions capable of reading data on at least one target device comprised in at least one remote storage array. At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify to include the Yu's details

Art Unit: 2182

of reading process would increase feasibility in both read and write requests of the combination.

As for claims 12 and 28, Yu teaches determining the status of said remote storage array, and, if said remote storage array is incapable of transmitting data in response to said one or more I/O transactions, regenerating said one or more I/O transactions to read data to said remote storage array at one or more preselected times [col. 6, lines 42-55; col. 11, lines 47-52]

As for claims 13 and 29, Yu teaches storing information based on data unread from said remote storage array on said local storage array, and, retrieving said information based on data unread from said local storage array [e.g., col. 6, lines 53-56; col. 11, lines 47-52].

As for claim 16, Yu teaches copying data from said at least one target device comprised in said at least one remote storage array to said at least one target device comprised in said local storage array [col. 11, lines 50-52].

Response to Arguments

14. Applicant's arguments with respect to claims 1-31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 2182

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ilwoo Park whose telephone number is (571) 272-4155. The examiner can normally be reached on Monday through Friday from 9:00 AM to 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tariq Hafiz can be reached on (571) 272-6729. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Ilwoo Park/
Primary Examiner, Art Unit 2182
October 8, 2008